

This Page Is Inserted by IFW Operations  
and is not a part of the Official Record

## **BEST AVAILABLE IMAGES**

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

**IMAGES ARE BEST AVAILABLE COPY.**

**As rescanning documents *will not* correct images,  
please do not report the images to the  
Image Problem Mailbox.**

# (12) UK Patent Application (19) GB (11) 2 339 404 (13) A

(43) Date of A Publication 26.01.2000

(21) Application No 9915455.1

(22) Date of Filing 01.07.1999

(30) Priority Data

(31) 19831166 (32) 11.07.1998 (33) DE

(71) Applicant(s)

Robert Bosch GmbH  
(Incorporated in the Federal Republic of Germany)  
Wernerstrasse 1, Stuttgart-Feuerbach,  
D-70442 Stuttgart, Federal Republic of Germany

(72) Inventor(s)

Guillermo Havenstein  
Steffen Weber

(74) Agent and/or Address for Service

A A Thornton & Co  
235 High Holborn, LONDON, WC1V 7LE,  
United Kingdom

(51) INT CL<sup>7</sup>

B27G 19/04

(52) UK CL (Edition R )

B5L LEG L102

(56) Documents Cited

DE 003421003 A US 4685214 A

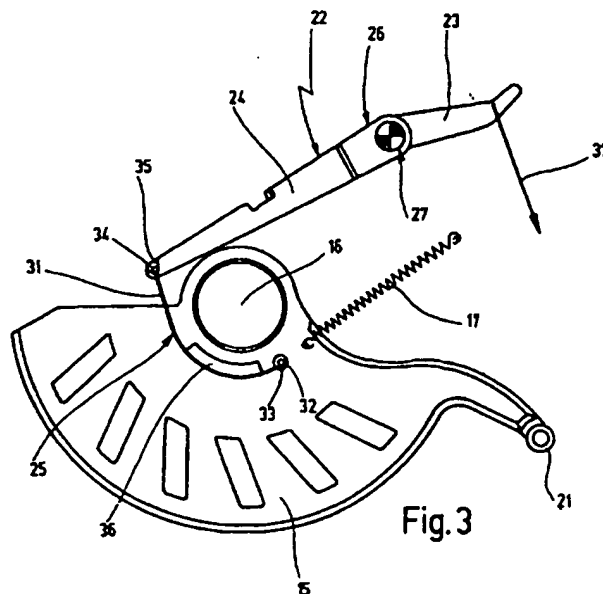
(58) Field of Search

UK CL (Edition Q ) B5L LEG LH LUX LX  
INT CL<sup>6</sup> B27B 9/00 , B27G 19/02 19/04  
On-line : WPI, EPODOC, JAPIO

(54) Abstract Title

Guard cover for a circular saw

(57) A hand-held circular saw machine has a saw blade (14, see Fig. 2) rotatably mounted in a housing (13, see Fig. 2) and protruding from the underside of the housing. The protruding part has an articulated guard cover 15 pivotally supported by housing 13 about an axis of rotation 16 coaxial with the axis of rotation of the saw blade. The guard cover is held in its closed, protective position by restoring spring 17 and has a manually operable swivelling device 22 for swivelling the guard cover away from the closed position to a position where the blade is exposed for cutting a workpiece. A flexible pulling means 25, e.g. a cable, converts the pivoting motion of control lever 23 about pivot 27 into rotation of the guard cover about axis 16. The cable runs over curved guide 36. Preferably the lever 23, 24 is a one-piece component 26.



GB 2 339 404 A

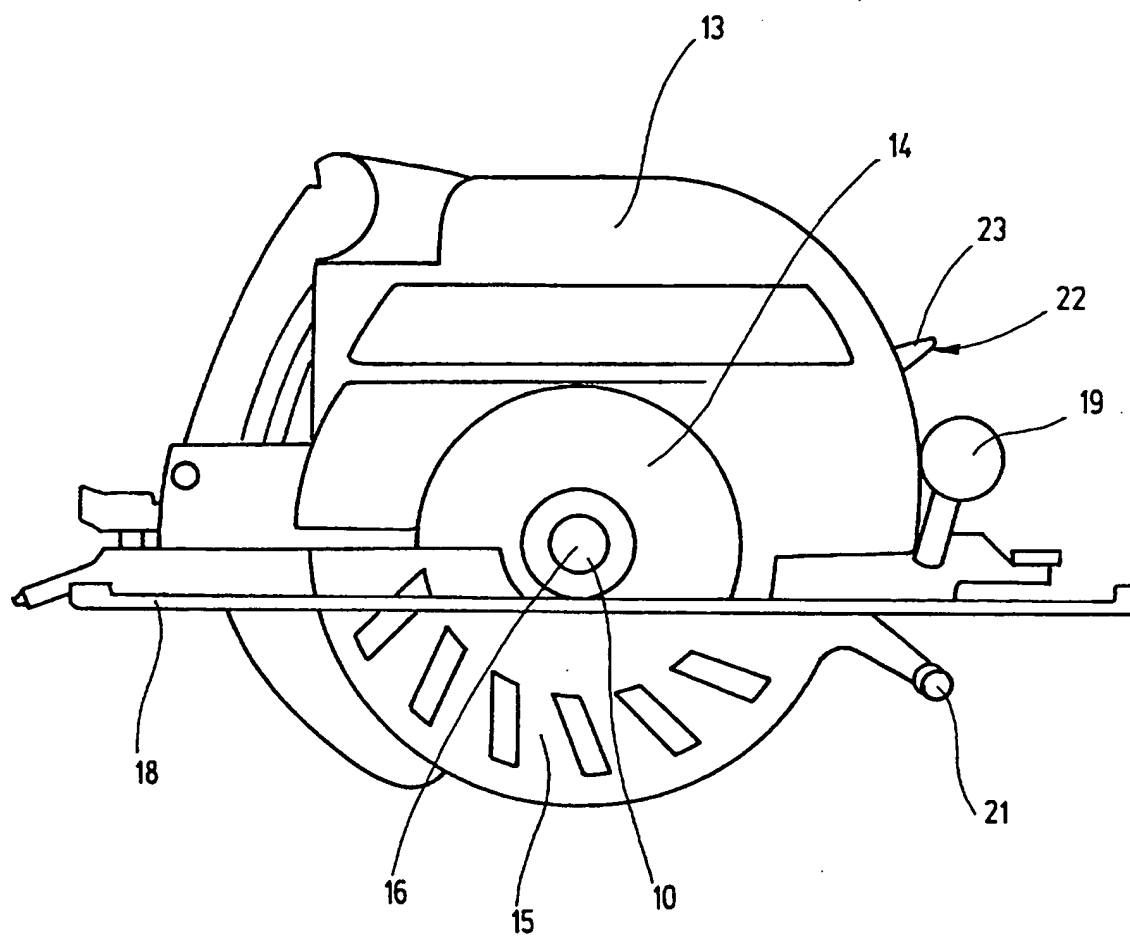
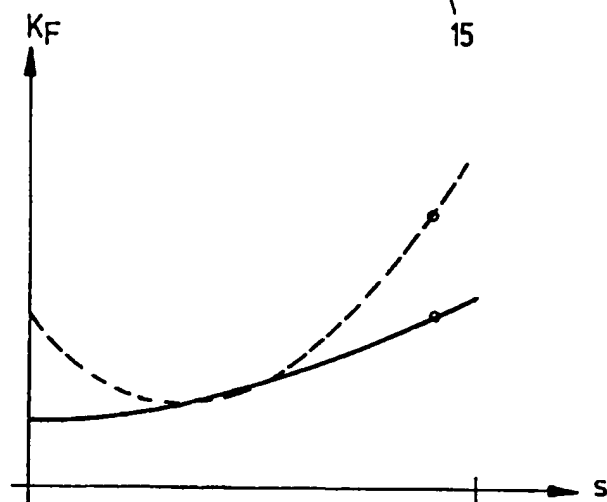
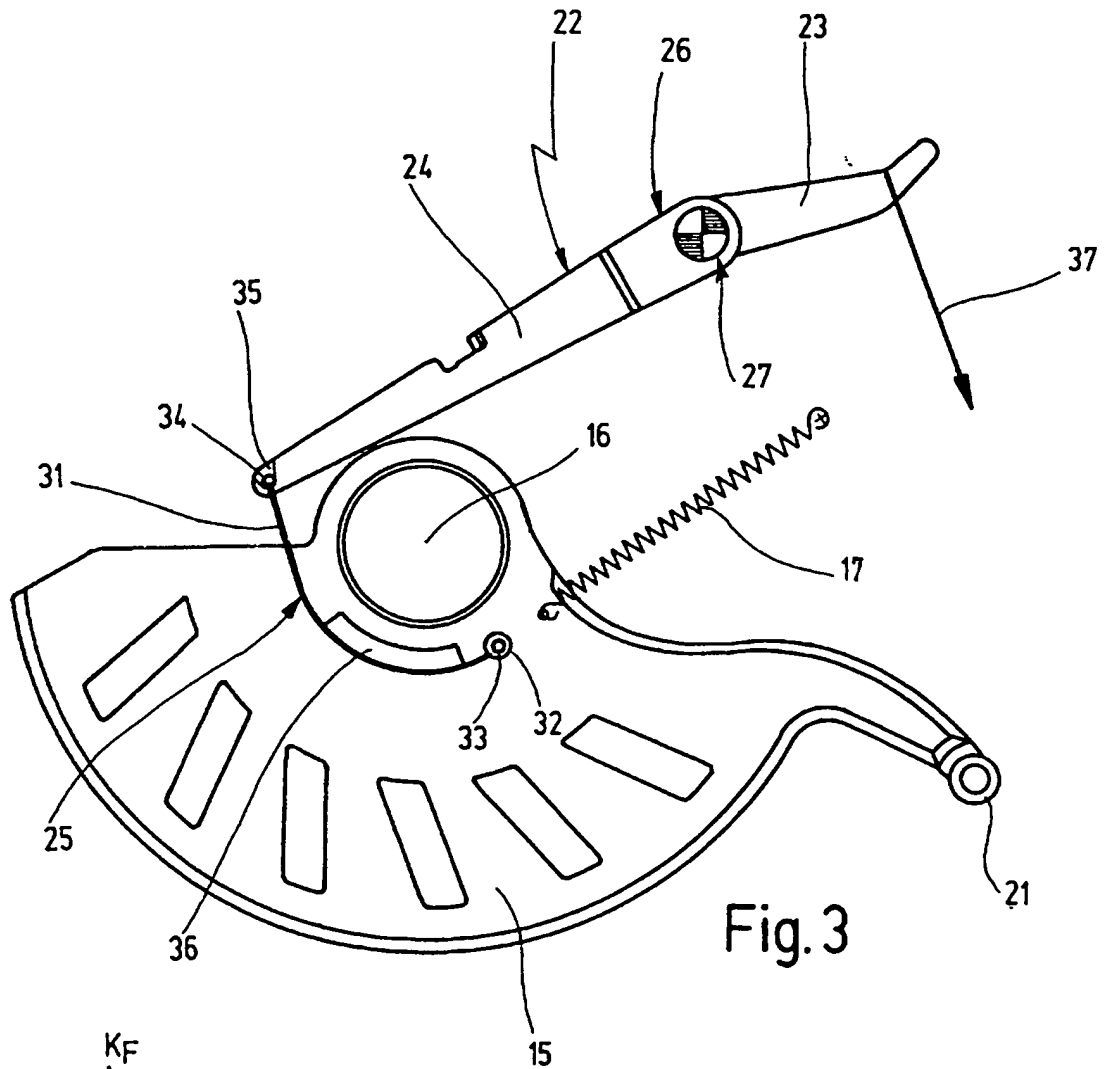
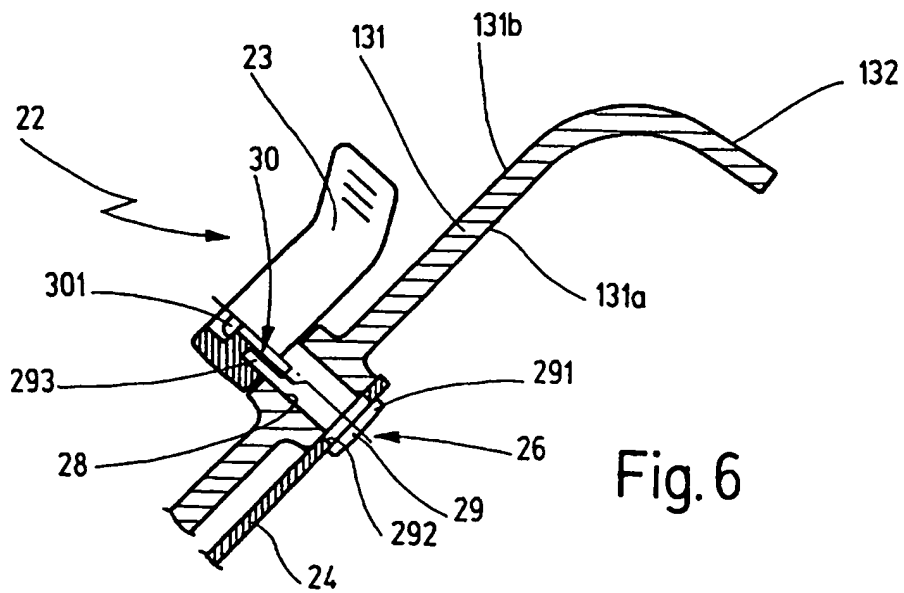
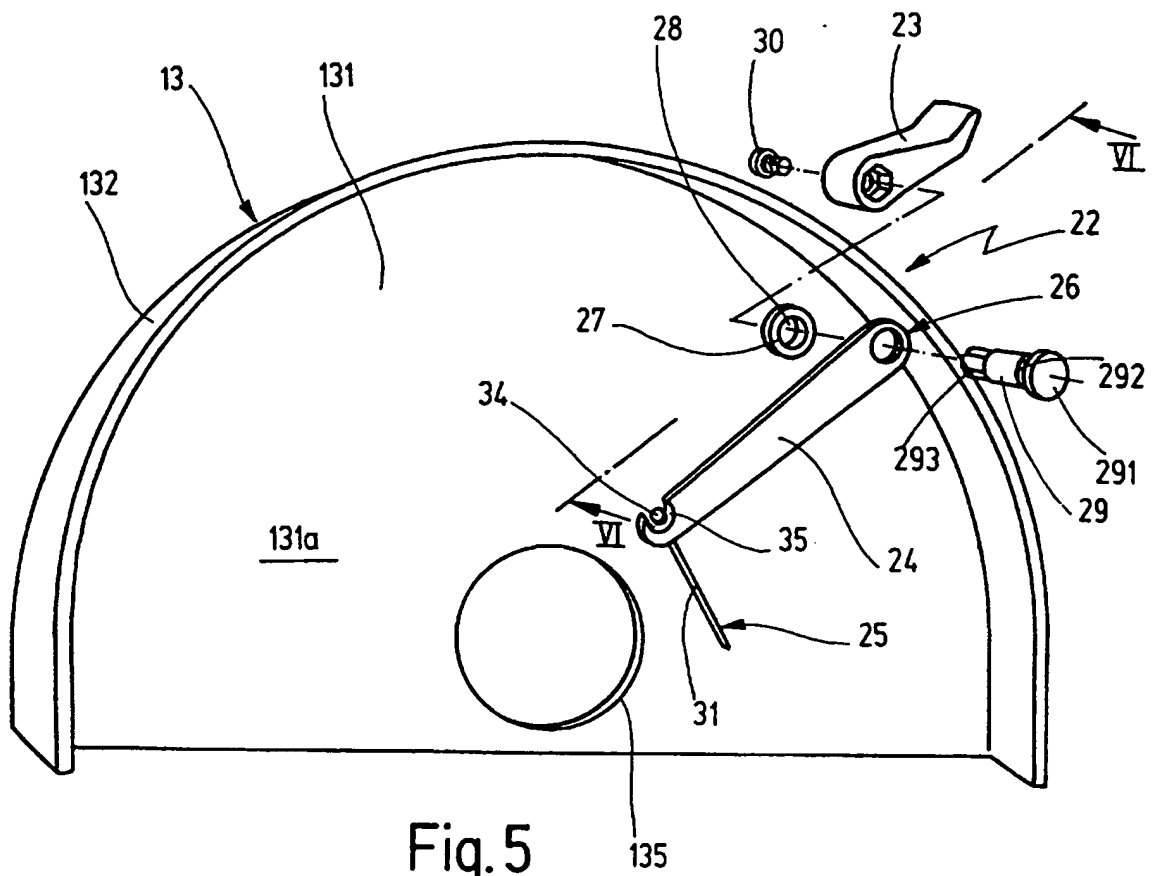
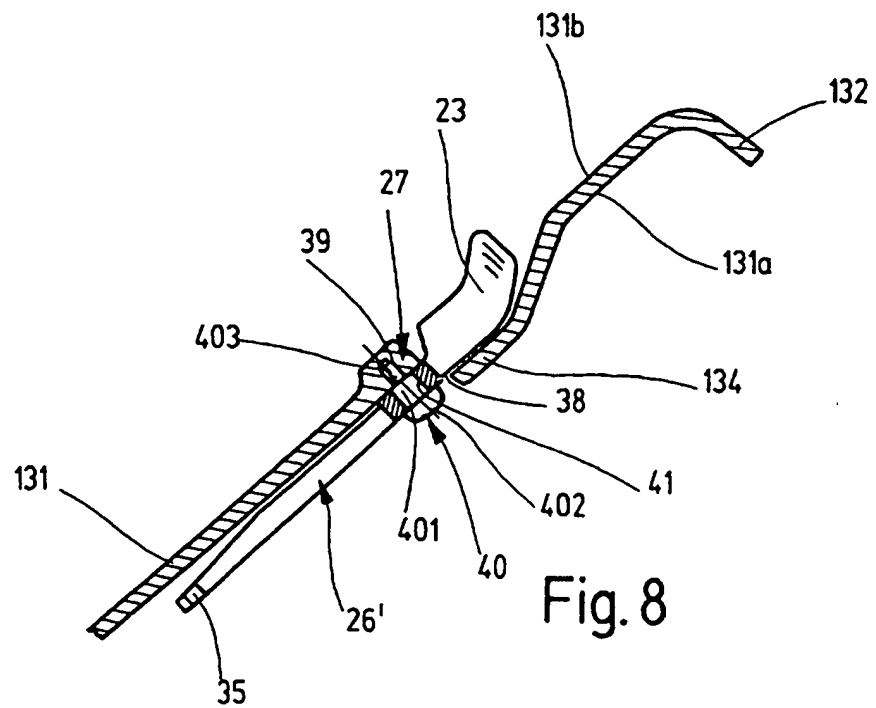
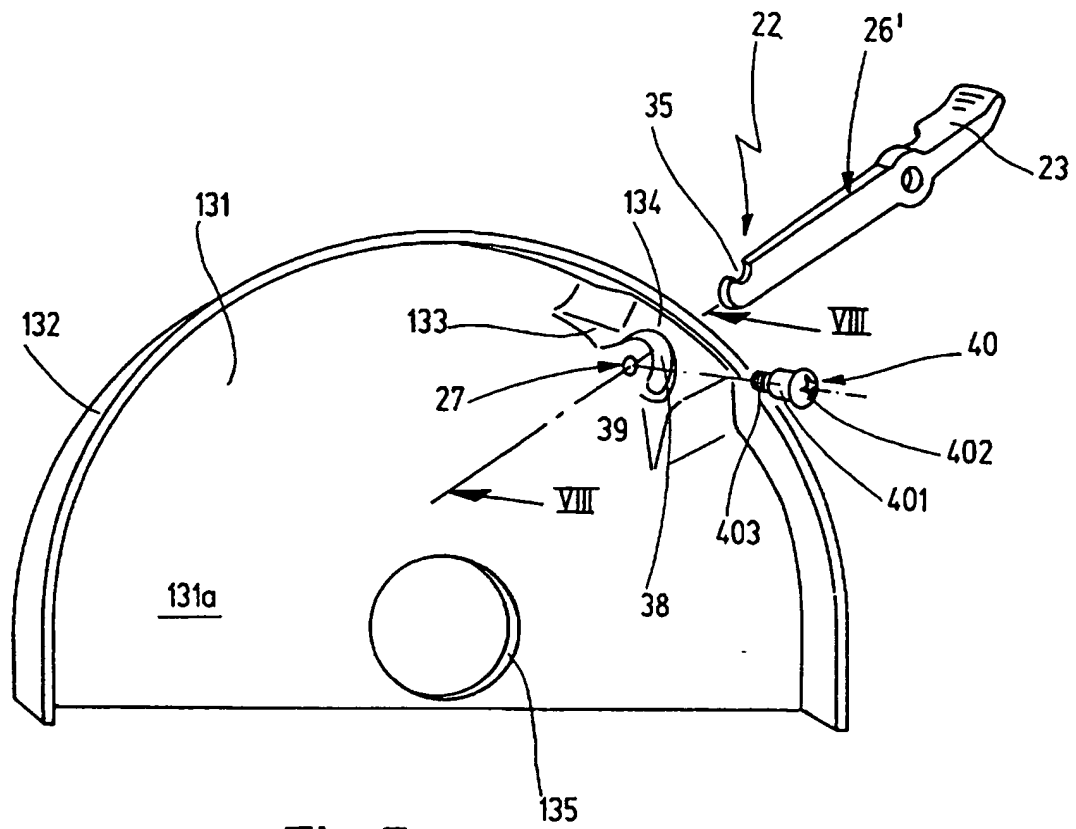


Fig. 2







Hand-held circular saw machine

## Background art

The invention relates to a hand-held circular saw machine according to the preamble of claim 1.

In hand-held circular saw machines, the articulated guard cover is used to screen off the saw blade region protruding from the housing and hence protect the user from being injured by the rotating saw blade. With progressive penetration of the saw blade into the workpiece the articulated guard cover, the front end of which abuts the workpiece, is increasingly swivelled back against the action of the restoring spring until it lies above the workpiece and releases the entire protruding region of the saw blade, thereby enabling the latter to penetrate the workpiece in an unimpeded manner.

In a known hand-held circular saw machine of said type (DE 44 03 189 A1), a swivelling device for manually swivelling the articulated guard cover upwards is provided, which comprises a control lever projecting from the machine housing. When said control lever is moved downwards, the swivelling device effects a rotation of the articulated guard cover with progressive release of saw blade and saw toothed rim in the protruding region counter to the action of the restoring spring.

## Advantages of the invention

The hand-held circular saw machine according to the invention having the features of claim 1 has the advantage that the swivelling device designed according to the

invention enables safe and easy opening of the articulated guard cover, i.e. swivelling of the articulated guard cover away from the saw blade, by hand. The force to be expended for said purpose is low and increases moderately only with progressive angular travel of the articulated guard cover. Compared to conventional hand-held circular saw machines, the torsional force acting upon the articulated guard cover is increased by virtue of the use of the flexible pulling mechanism from previously 15% to 38% of the finger force applied on the control lever. Thus, safe and ergonomically optimized swivelling of the articulated guard cover is ensured. The manufacturing costs are low because the swivelling device is particularly easy to assemble.

Advantageous developments and improvements of the hand-held circular saw machine indicated in claim 1 are possible by virtue of the measures outlined in the further claims.

According to a preferred embodiment of the invention, the control lever is part of a two-armed operating lever and the flexible pulling mechanism is fastened to the end of the operating lever remote from the control lever. The two-armed operating lever may in said case be of an integral design or be made up of two parts, the one-armed control lever and a one-armed swivelling lever, which are rigidly connected to one another at their common bearing point.

According to an advantageous embodiment of the invention, a cable is used as a flexible pulling mechanism, which is fastened at one end by eyelet and rivet to the cover and at the other end by ball and pocket to the control lever.

According to an advantageous embodiment of the invention, there is disposed on the articulated guard cover concentrically with its axis of rotation a curved guide



element, against which a portion of the cable lies. By virtue of the configuration of the guide element an optimum deflection of the pulling force acting upon the articulated guard cover is achieved.

The hand-held circular saw machine according to the invention having the features of claim 7 has the advantage that the swivelling device for the articulated guard cover may be realized with only a few individual parts and, in said case, the arrangement of the control lever at the outside of the housing may be retained. By virtue of introducing the housing step with opening and with the parallel offset of the wall portion of the housing wall, the control lever may be combined with a further necessary transmission element of the swivelling device into a flat, plane, integral operating lever which requires only one further component for its pivoted bearing arrangement on the housing wall. Thus, material, manufacturing and assembly costs for the swivelling device are reduced.

The combination of the features of claim 7 with the features of claim 1 results in an, in terms of manufacture and handling, optimized swivelling device for the articulated guard cover of the hand-held circular saw machine.

#### Drawings

There follows a detailed description of embodiments of the invention which are illustrated in the drawings. The drawings show:

Fig. 1            a perspective view of a hand-held circular saw machine,

Fig. 2            a view of the hand-held circular saw machine in the direction of arrow II in Fig. 1,

- Fig. 3 a side view of an articulated guard cover with swivelling device of the hand-held circular saw machine in Fig. 2,
- Fig. 4 a diagram showing the characteristic of the force on the control lever of the swivelling device plotted against the angular travel of the control lever,
- Fig. 5 an exploded view of the swivelling device in Fig. 3,
- Fig. 6 a section along the line VI-VI in Fig. 5,
- Fig. 7 the same view as in Fig. 5 with a modified swivelling device,
- Fig. 8 a section along the line VIII-VIII in Fig. 7.

#### Description of the embodiments

The hand-held circular saw machine, a perspective view of which is shown in Fig. 1, has a housing comprising a motor housing 11, a gear case 12 and a cover 13. In the cover 13 a circular saw blade 14 (Fig. 2) is accommodated in such a way that it is screened off in an upward direction and protrudes in a downward direction. As Fig. 5 reveals, the cover 13 for said purpose comprises a housing wall 131 extending parallel to the saw blade 14 and having a coaxial bearing shell 135, through which a gear shaft 10 (Fig. 2) for receiving the saw blade 14 passes, as well as a semi-circular collar 132 projecting at right angles from the housing wall 131 and overlapping the saw blade toothed rim with radial clearance. The protruding region of the saw blade 14 projecting downwards from the cover 13 is

overlapped by an articulated guard cover 15 (Fig. 2), which is supported on the cover 13, namely on the latter's bearing shell 135, so as to be rotatable about an axis of rotation 16 coaxial with the saw blade axis and the gear shaft 10. The articulated guard cover 15 is held in its closed position, in which the saw blade 14 is fully covered, by means of a restoring spring 17 (Fig. 3) in the form of a tension spring. The housing formed by motor housing 11, gear case 12 and cover 13 is disposed on a base plate 18 and may be swivelled up and down relative to the base plate 18 to alter the depth of cut. The base plate 18 carries an additional handle 19 for reliable two-handed guidance of the hand-held circular saw machine during sawing as well as a lateral stop 20 for parallel guidance of the hand-held circular saw machine, in a supported manner relative to the edge of a workpiece. During sawing, the articulated guard cover 15 abuts the side surface of the workpiece to be sawn by means of a stop 21 lying, in sawing direction, at the front and, as the depth of penetration of the saw blade 14 into the workpiece increases, is progressively swivelled back counter to the action of the restoring spring 17 until it finally lies above the workpiece and is supported by its stop 21 on the top of the workpiece. Thus, the entire protruding region of the saw blade 14 is released and the latter may penetrate the workpiece in an unimpeded manner.

For setting the hand-held circular saw machine onto the workpiece, the articulated guard cover 15 may be swivelled by means of a manual swivelling device 22 partially or entirely away from the saw blade 14 in order to be in a better position to assign the saw blade 14 to a predetermined saw cut. Said swivelling device 22, which is shown complete in Fig. 3, comprises a pivotally mounted, manually operable control lever 23 accessible from outside of the cover 13, a swivelling lever 24 and a flexible pulling mechanism 25 attached to the swivelling lever 24 and the articulated guard cover 15. The control lever 23 and the swivelling lever 24 are combined into a two-armed operating lever 26 in that the two levers are

rigidly connected to one another at their bearing point 27 in the housing wall 131. As Fig. 5 reveals, the bearing point 27 comprises a bearing bush 28, which is formed in the housing wall 131 and through which a stud bolt 29 is inserted. The swivelling lever 24 is seated non-rotatably on a toothed portion 292 of the stud bolt 29 and extends parallel to the housing wall 131 at the inside 131a of the latter, while the operating lever 23 is seated non-rotatably on a hexagonal portion 293 of the stud bolt 29 and lies at the outside 131b of the housing wall 131. The stud bolt 29 rests with a radial flange 291 against the swivelling lever 24 and is held in a rotatable and axially non-displaceable manner in the bearing bush 28 by means of a screw 30, which is screwed from the outside 131b of the housing wall 131 into the stud bolt 29 and with its screw head 301 axially fixes the control lever 23.

As Fig. 3 shows, the flexible pulling mechanism 25 here takes the form of a cable 31, which is provided at its cover-side end with an eyelet 32 and fastened by means of a rivet 33 inserted through the eyelet 32 in a rotatable manner to the articulated guard cover 15, namely at a radial distance from the axis of rotation 16 of the articulated guard cover 15. The lever-side end of the cable 31 is provided with a ball 34, which lies in a pocket 35 formed at the lever end of the swivelling lever 24. Disposed on the articulated guard cover 15 concentrically with the axis of rotation 16 of the articulated guard cover 15 is an axially projecting, curved guide element 36, against which a portion of the cable 31 rests. Alternatively, a wire or chain may be used as pulling mechanism 25.

When a finger force symbolized in Fig. 3 by arrow 37 is applied onto the control lever 23, the control lever 23 swivels downwards and the end of the two-armed operating lever 26 remote from the control lever swivels, in Fig. 3, upwards in a clockwise direction. In the process, by means of the cable 31 the articulated guard cover 15 is swivelled clockwise about its axis of rotation 16 so that it progressively

releases the saw blade 14. In the diagram in Fig. 4, the finger force  $K_f$  required to swivel the articulated guard cover 15 is plotted against the angular travel  $s$  of the control lever 23. "Closed" denotes the closed position of the articulated guard cover 15 and hence the upper position of rest of the control lever 23 and "open" denotes the open position of the articulated guard cover 15 and hence the lower position of the control lever 23, in which the saw blade 14 is fully released. As is clearly apparent, the required opening force at the start of the opening operation is low and increases virtually constantly with the opening angle. As a comparison, the dashed line in Fig. 4 shows the force diagram of known swivelling devices, in which the required operating force at the start and end of the opening operation is much higher.

Figs. 7 and 8 show a modification of the swivelling device 22 such as may equally be used in the hand-held circular saw machine according to Figs. 1 and 2. Here, the control lever 23 accessible from outside of the cover 13 is formed by the one arm of an integral, two-armed operating lever 26', which is pivotally mounted at the bearing point 27 of the housing wall 131. The housing wall 131 has a parallel wall portion 134 emanating from the bearing point region, extending radially in the direction of the housing wall collar 132 and offset in axial direction by means of an incorporated housing wall step 133. Introduced into the housing wall 133 is a radial opening 38, through which the integral operating lever 26' is passed in such a way that the lever arm forming the control lever 23 extends along the outside 131b of the wall portion 134 and the lever arm remote from the control lever 23 extends along the inside 131a of the housing wall 131. As a bearing arrangement of the operating lever 26', there is introduced into the housing wall 131 a threaded bore 39, into which a shoulder screw 40 is screwed. A cylindrical portion 401 of the shoulder screw 40 is inserted through a bearing bore 41 in the operating lever 26' so that, after the shoulder screw 40 has been screwed in, the

operating lever 26' rotates freely on the cylindrical portion 401 and at the same time is locked against axial displacement by the screw head 402 of the shoulder screw 40 and the housing wall 131. Otherwise, the construction and mode of operation of the swivelling device 22 according to Figs. 7 and 8 correspond to the previously described swivelling device 22, with the result that identical components are provided with identical reference characters. In particular, here too, the operating lever 26' is connected by a cable to the articulated guard cover 15, wherein the cable end is likewise accommodated in a pocket 35 formed in the operating lever 26', namely in the end of the latter remote from the control lever 23.

## Claims

1. Hand-held circular saw machine having a housing (13), having a circular saw blade (14) rotatably mounted in the housing (13) and protruding partially from the underside of said housing, having an articulated guard cover (15) which overlaps the saw blade (14) in the protruding region of the latter and is supported in the housing (13) about an axis of rotation (16) coaxial with the saw blade axis and is held in its closed position fulfilling the protective function by means of a restoring spring (17), and having a manually operable swivelling device for partial or complete swivelling of the articulated guard cover (15) away from the saw blade (14), which swivelling device comprises a pivotally mounted, manually operable control lever (23) accessible from the outside of the housing (13) and converts the swivelling motion of said control lever into a rotating motion of the articulated guard cover (15), characterized in that for converting the swivelling motion of the control lever (23) into a rotating motion of the articulated guard cover (15) a flexible pulling mechanism (25) is provided, which is attached to the articulated guard cover (15) at a radial distance from the latter's axis of rotation (16).
2. Machine according to claim 1, characterized in that the control lever (23) is part of a two-armed operating lever (26) and that the flexible pulling mechanism (25) is fastened to the end of the operating lever (26) remote from the control lever.
3. Machine according to claim 1 or 2, characterized in that the pulling

mechanism (25) is a cable (31).

4. Machine according to claim 3, characterized in that disposed on the articulated guard cover (15) and extending concentrically with the latter's axis of rotation (16) is a curved guide element (36), against which a portion of the cable (31) lies.
5. Machine according to claim 3 or 4, characterized in that the cable (31) at its cover-side end is provided with an eyelet (32) which is fastened, preferably in a rotatable manner, by means of a rivet (33) to the articulated guard cover (15).
6. Machine according to one of claims 3 - 5, characterized in that the cable (31) at its lever-side end is provided with a ball (34), which lies in a pocket (35) formed at the lever end of the operating lever (26).
7. Hand-held circular saw machine according to the preamble of claim 1, in particular according to one of claims 1 - 6, characterized in that the control lever (23) is formed by the one arm of an integral, two-armed operating lever (26'), which is pivotally mounted on a housing wall (131) of the housing (13), that the housing wall (131) comprises a parallel housing wall portion (134) which is offset in axial direction by means of an incorporated housing wall step (133), that a radial opening (38) is introduced in the housing wall step (133) and that the operating lever (26') is passed through the opening (38) in such a way that the lever arm forming the control lever (23) lies at the outside and the other lever arm lies at the inside



of the housing (13).

8. Machine according to claim 7, characterized in that the pivoted bearing arrangement of the operating lever (26') is effected close to the housing wall step (133).
9. Machine according to claim 7 or 8, characterized in that, as a bearing arrangement of the operating lever (26'), a threaded bore (39) is introduced in the housing wall (131) extending parallel to the saw blade (14) and in said threaded bore is screwed a shoulder screw (40), which receives the operating lever (26') in a rotatable and axially non-displaceable manner on a cylindrical portion (401).
10. Machine according to one of claims 1 - 9, characterized in that the housing wall (131) is part of a cover (13), which accommodates the saw blade (14) and has a semi-circular collar (132), which projects at right angles from the housing wall (131) and overlaps the saw blade toothed rim with radial clearance.
11. A hand-held circular saw substantially as herein described with reference to the accompanying drawings.



Application No: GB 9915455.1  
Claims searched: 1 to 11

Examiner: Graham S. Lynch  
Date of search: 23 September 1999

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): B5L (LEG, LH, LX, LUX)

Int Cl (Ed.6): B27B 9/00; B27G 19/02, 19/04

Other: On-line : WPI, EPODOC, JAPIO

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
X	DE 3421003      FESTO KG.    Note Figures 2, 3 and accompanying abstract.	1, 3, 4.
X	US 4685214      SHEARON et al.    Figures 8 to 15. Column 4, line 38 to column 6, line 41.	1, 3, 4.

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.